Engine Oil

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Introduction
There exists a complex group of ratings, classifications, grades etc surrounding today's engine oils. Engine oils have become more sophisticated as have the engines requiring these oils.

Engine Oil Requirements.

Overview

Basically, lubricants reduce friction and prevent wear between moving parts. Today’s equipment requires more sophisticated lubricants. The development of more powerful engines is constantly changing our technology and lubricants must be formulated to perform under new conditions.

Today’s high performance, light-duty automotive and heavy duty diesel engines demand a great deal from lubricating oil.

Oil Must Reduce Friction And Wear

Engine friction and wear are results of the close fitting of moving parts. Combustion by products and other contamination carried in the oil also add chemical and abrasive engine wear.

To prevent metal-to-metal contact, the oil must maintain enough viscosity or film thickness to provide a cushion between moving parts under all operating temperatures.

In spite of high–localized operating temperatures, the viscosity must be no higher than necessary and still give good starting and provide the least friction under sustained running.

Oil Must Cool Moving Parts

Engine oil is largely responsible for piston cooling. This is done by:

- Direct heat transfer through the oil film to the cylinder walls and into the cooling system
- Carrying heat from the underside of the piston crown and skirt to the engine crankcase

Oils of equal viscosities have comparable heat transfer capabilities, but the oil must have enough heat stability to resist decomposition when in contact with the hot surfaces.

Oil Must Help Seal The Cylinders

During combustion, pressure in the cylinders may be 18,000 kPa (2600 psi) or higher. Oil helps the piston rings to seal the pressure in the cylinder by forming an oil film between the piston rings and the cylinder walls.

Oil Must Keep Parts Clean

Contrary to popular opinion, engine oils do wear out. Extended service depletes the additives and oxidizes the base oils, forming harmful compounds. While good filtration will prolong oil life, many contaminants are soluble in the oil and can pass through the
filter. These contaminants are primarily unburned or partially burned fuel, but corrosive acids and water are also present. The oil must prevent the formation of corrosive compounds or, once formed, keep them in suspension so they do not settle on the engine’s internal surfaces.

**Summary**

If the engine oil is to fulfill all these requirements, it must do the following:

- Keep a protective oil film on moving parts
- Resist high temperatures
- Resist corrosion
- Prevent ring sticking
- Prevent sludge formation
- Flow easily at low temperature
- Resist thickening after prolonged use
- Resist foaming
- Suspend insoluble and minimize deposit

**Engine Oil Classifications**

**Introduction**

Engine oils have been around since the internal combustion engine was introduced in the 19th century to replace horses. However, for a long time, there was no difference between those oils and any other medium-grade straight mineral oil one would use to lubricate sliding surfaces. The earliest definitions for any standard adopted by the American Petroleum Institute (API) were for the quality of the pure base oil, expressed mainly in terms of “thickness” and API gravity. There was the API definition of early engine Oils “SA,” when present oil category classification was adopted in 1970 (“S” stood for “spark,” and “A, “well, that’s the first letter of the alphabet!) And things progressed from there.

The industry did not begin to realize the benefits of compound blending engine oils—mixing the oil with additives—to help the oil last longer and provide more engine protection until much later in the 1950s. The first compounded motor oils for gasoline engines hit the market in 1964 and were later categorized as API SC, which interestingly continues to exist in some parts of the world.

Since then, with relatively great success in terms of benefiting the consumer at large, API through its member representatives, has been able to maintain strict definitions of engine oil quality standards, or performance categories as commonly known, for both gasoline and diesel engines. But API members are not the only ones in the business of developing, defining and enforcing these standards, and these activities are collaborative efforts between many organizations.

A number of separate organization cooperate to provide standards and classification systems so engine oil performance can be tested and rated- the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the American Society for Testing Materials (ASTM). Various engine manufacturers or original equipment manufacturers (OEMs) and the military also provide their own specifications.

**What Are API Ratings?**

The American Petroleum Institute (API) classification system provides information about the engine oil.

The letter “S” followed by another letter (for example “SM”) indicates that the oil is appropriate for petrol or gasoline engines. SM oils are superior to SL oils in many
performance criteria including enhanced fuel efficiency whilst also meeting the “energy conserving” classification and enhanced emission systems protection.

The letter “C” followed by another letter and / or number (for example CI-4) indicates that the oil is appropriate for diesel engines.

The second letter in both the “S” and the “C” categories is assigned alphabetically. Generally the further along we move in the alphabet indicate the latest technology and quality enhancements in engine oils.

Selecting the right oil may often seem confusing with the various classifications provided by these organizations.

**SAE Viscosity Grades**

The Society of Automotive Engineers has developed viscosity grade classification systems for engine oils, SAE J 300. Viscosity is a measure of the oil’s fluidity at a given temperature. Oils vary in viscosity as the temperature changes; they become more fluid as the temperature increases and less fluid as the temperature decreases. Having fluid oil for cold morning starts is very critical. Engine oil must provide lubrication before the operating temperature is reached or severe component wear will occur.

Keep the following in mind when interpreting viscosity classifications:

- The SAE standard assign numbers called viscosity grades to identify the oil’s resistance to flow. Examples are 20, 30, 40 and 50.
- Viscosity grades 20 and above must meet a high-temperature viscosity requirement.
- The letter “W” after the viscosity grade number indicates the oil has met a low-temperature (winter) requirement. Examples are 0W, 5W, 10W, 15W, 20W and 25W.

**Multi-Viscosity Oils**

For engine subjected to wide degrees of operating temperatures, single grade oils should not be used. Multi-grade or multi-viscosity oils are formulated to meet both low temperature viscosity requirements as well as high temperature viscosity requirements. These oils are identified as 10W-30, 15W-40 and so on. They are formulated by blending various base oils to obtain a viscosity grade such as 15W and adding polymers called viscosity index improvers. These polymers do not significantly affect oil viscosity at low temperature, but they expand when the oil temperature rises. This expansion results in an increase in viscosity at higher temperature that yields multi-grade oils such as 15W-40. Some oils may use synthetic oil or mixture of petroleum-base and synthetic oil to obtain the multi-viscosity rating.

**What Are ACEA Ratings?**

ACEA stands for the Association des Constructeurs Européens d’Automobiles and represents a large group of European engine manufacturers. ACEA has established the following four performance categories: the A category for petrol or gasoline engines; the B category for passenger car diesel engines; the C category represents catalyst compatible oils; the E category for heavy duty diesel engines.
What Are ILSACS Ratings?

ILSAC stands for the International Lubricant Standardization and Approval Committee. For lubricants to meet the GF specifications, they must prove to be energy conserving. With the latest rating being GF-5. It provides better fuel economy than GF-4. In Malaysian market you may find the following ILSAC ratings:

- ILSAC GF-4 (introduced in 2004)
- ILSAC GF-5 (introduced in 2010)

What Are OEM Approvals?

Some OEMs specify the engine oils must meet range of stringent requirements before it can be used and warranted in their engines. To minimize misapplication, we have noted these requirements have been met by noting OEM performance specification on pack: the most common approval in Malaysia being the following:

- Mercedes Benz: MB 229.1, MB 229.3 and MB 229.5
- Volkswagen: VW 502.00, VW 503.01 and VW 504.00